The 1987 "Boatload of Knowledge"—Graduate Environmental Research and Education on the Ohio River[1]

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ABSTRACT. A modern version of the 1826 *Boatload of Knowledge* journey down the Ohio River was accomplished in the summer of 1987 with a 965 km, 15-day, graduate education and research trip on the river from Pittsburgh, PA, to Louisville, KY. Nine graduate students from throughout the Ohio River Basin were involved in an educational program that involved individual research projects and project planning and logistics. Eighteen faculty from 11 different colleges and universities and 33 professionals from various agencies, industries, and organizations participated in lectures and other presentations for the students along the journey. A total of 173 people were involved in some aspect of the 15-day trip. Emphasis was on the ecological and environmental issues of the river and its valley, the historical aspects of human cultures, and the use of natural resources along the river. Research results included two research studies each on the sediment and water quality of the river along its length, a census on bird populations along the river, and an assessment of tree damage caused by air pollution in the Ohio Valley. Educational results included a much better understanding of the logistics and advantages of combined research-graduate education field courses along a major waterway.

OHIO J. SCI. 89 (5): 118-127, 1989

INTRODUCTION

The Ohio River is one of America's most environmentally and historically significant waterways. Yet, little has been done to integrate studies of science and history of the river. Scientists have studied particular reaches of the river and historians understand the history of selected settlements along the river. But few efforts have been made to study the Ohio as a total system. Because a river is long and narrow, like a highway, we tend to think of it only as a conduit rather than as a functionally connected system. To understand the cultural development of the Ohio River Valley and its modern-day threats of pollution, we must travel its length, observing, measuring, and continually asking why and how about everything that we see on this watery highway. This was the guiding premise of our trip.

Our idea was a modern version of Robert Owen's 1825-26 *Boatload of Knowledge* (Pitzer 1989), travelling the length of the Ohio River by a boat-classroom with a hand-picked staff of graduate students/scientists to observe and collect primary data on the Ohio River. Our excursion, like the trip 162 years before, would offer a unique opportunity to view the human and ecological diversity of the Ohio River Basin. We were as interested in determining current environmental conditions as we were exploring the history of resource use and abuse along the Ohio River (Frost and Mitsch 1989). The onboard classroom would have an everchanging scene as a backdrop as the students would learn first-hand the environmental issues of the river, its historical development, and the continued importance of the river to water supply, navigation, and other human uses.

The Ohio River

The Ohio River Basin is a region of 528,000 km^2 (204,000 square miles) covering parts of 14 states. The Ohio River itself flows 1,578 km (981 miles) from the confluence of the Allegheny and Monongahela Rivers in Pittsburgh, PA, to Cairo, IL, where it joins the Mississippi River. Although once free-flowing, the Ohio River is now a series of navigational pools formed from the 20 locks and dams throughout its length. The river basin's economy has had a history of heavy industry. Steel mills, chemical industries, electrical power generation, and coal mining have formed the economic backbone of the region. The Ohio River is a major transportation artery for coal, petroleum products, minerals, grain, fertilizer, iron ore, iron, and steel.

MATERIALS AND METHODS

Our *Boatload of Knowledge* was planned as a 965 km (600 mile), 15-day graduate course and research excursion down the Ohio River during the summer of 1987 from Pittsburgh, PA, to Louisville, KY (Fig. 1). A group of graduate students from universities throughout the Ohio River Basin, accompanied by the authors of this paper, would travel approximately 80 km (50 miles) each day on a houseboat. Graduate credit for participation was given to students through their home institutions. All students were provided with a daily luncheon and land-based nightly lodging at nearby universities, colleges, parks and other facilities. The emphasis of the trip was on research and graduate education in a unique and stimulating classroom on water.

Course Development

To fulfill the course objectives, topics related to ecological issues and riverine cultural history were compiled. Emphases were on impacts of humans on the river and its valley, as well as the role of the river in cultural developments. The river was then geographically divided into 14 sections (to evenly divide the trip), and the most pertinent topics within those geographic sectors were chosen for inclusion in the curriculum (Fig. 2). The topics were determined by the availability of resource persons, their relevance to the *Boatload of Knowledge* theme, and logistical factors such as food, lodging, and the number of locks through which to pass. Even with these mitigating factors, no significant topics were excluded.

One of the most important planning aspects was to assemble a faculty to teach the history and ecology of the Ohio River. Rather than utilizing only one or two individuals, our approach was to contact many individuals who would meet with the boat along its route and lecture on predetermined topics. The plan was to minimize the travel distance of these lecturers, particularly since they would most likely be more familiar with the river in the vicinity of their communities.

[1]Manuscript received 9 November 1988 and in revised form 30 March 1989 (#88-24).

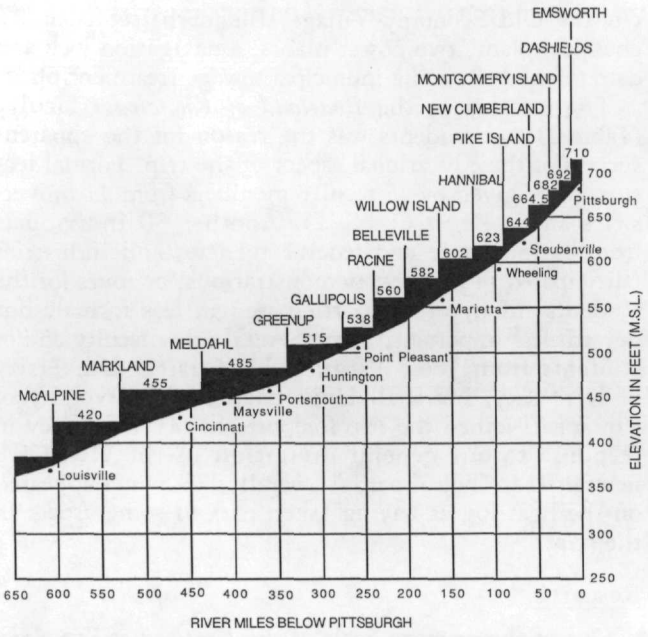


FIGURE 1. Navigational Pools of the Ohio River along route of *1987 "Boatload of Knowledge"* from Pittsburgh, PA to Louisville, KY (adapted from U.S. Army Corps of Engineers drawing).

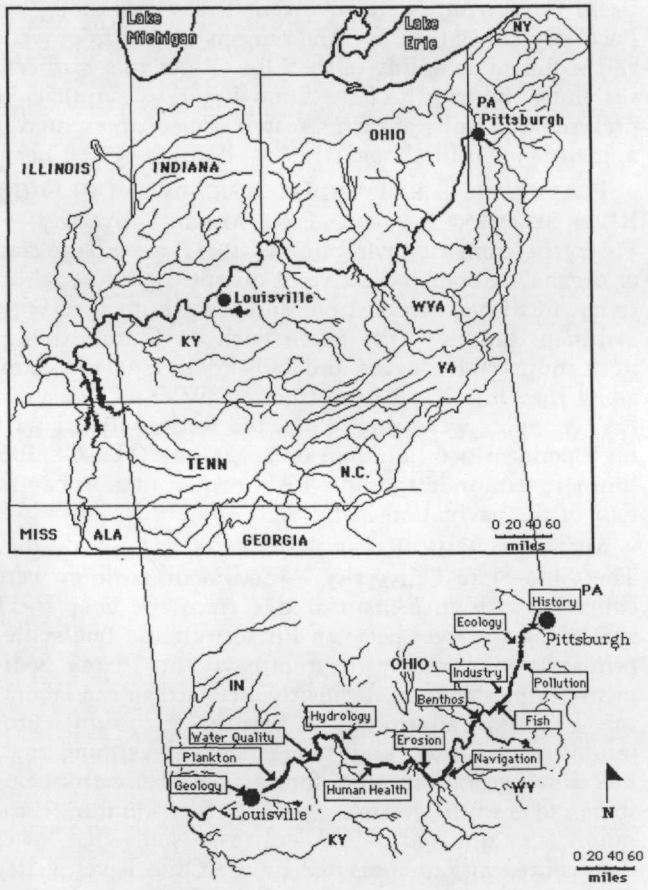


FIGURE 2. Topics to Be Covered along *1987 "Boatload of Knowledge"* Voyage, with Indication of Approximate Location Where Topic is Presented.

The Boat and Land Transportation

The boat, leased from Marshall University, was a 13 m (43 foot) houseboat (Fig. 3) captained by Professor Ralph Taylor of that university, who also served as one of the faculty for the *Boatload of Knowledge*. The twin-engine vessel provided adequate space for daily

FIGURE 3. House boat used in *Boatload of Knowledge* trip.

food storage, cooking and refrigeration, storage for water and sediment sampling equipment, a small lounge for lectures/discussion, and deck space for bird-watching, observations, note-taking, and recreation. It was planned that for the majority of the trip, 15 or fewer persons would be sharing the boat at any one time, thus assuring optimum working and personal space for each.

Ground transportation, logistical backup, radio contact (via U.S. Army Corps of Engineers Lock and Dam site equipment) with the boat, food and maintenance service, and speaker transport were provided by a driver and a 15-passenger van. Faculty and graduate associates of The Ohio State University shared the driving duties.

Student Selection

Nine graduate students were chosen to participate in this *Boatload of Knowledge* educational experience based on a variety of criteria. Six of the students conducted research projects related to the Ohio River, and three students assisted with logistical details of the trip. An attempt was made to bring together a group of students representing a diversity of institutions, backgrounds, skills and interests.

Posters were prepared in November 1986, eight months prior to the voyage, to announce the *Boatload of Knowledge* course and to stimulate student interest. Posters were distributed to individuals at each member university and college of the Ohio River Basin Consortium for Research and Education (ORBCRE) at the November 1986 Annual Meeting of the Consortium in Wheeling, WV, and through the mail after that. Students were asked to fill out a card indicating their interest and requesting further information. Approximately 60 students responded. These students were sent a complete application package in February 1987 in which they were asked to propose a research project for the trip and indicate why they were interested in the trip. Graduate student selection for participants in the *Boatload of Knowledge* was based on the following criteria: 1) graduate status in an academic institution in the Ohio River Basin, preferably a member institution of the ORBCRE; 2) an interest in pursuing an on-the-river research project which was applicable to the trip and for which data collection for the study was feasible on the trip; 3) an academic advisor at their home institution who was willing to oversee the student's project; 4) availability of graduate credit for the course from their home institution; and 5) quality and scope of their research project proposal.

Care was taken to ensure recruitment of a good representation of students from throughout the Ohio River Basin and from a range of disciplines. Scholarships for student participants covered all expenses except breakfasts, dinners, and transportation from their home community to Columbus, OH, for the beginning of the trip. Each student received the *Boatload of Knowledge* Course Materials, which included copies of handouts for each of the lecturers. They were also given copies of selected publications including *The Ohio Valley* (Laycock and Laycock 1983), pamphlets from some of the industries that were to be visited, and maps of the river.

RESULTS AND DISCUSSION

Graduate Education

The academic portion of the *Boatload of Knowledge* took place through formal lectures, demonstrations, and tours

for the student participants. Final presentations covered a broad range of ecological and historical/cultural topics (Table 1). Because of our use of the historical name *Boatload of Knowledge,* taken from the 1825-26 river trip of Robert Owen's group of educators, scientists, and utopians who traveled from Pittsburgh to New Harmony, IN, Professor Donald Pitzer of Southern Indiana University was asked to present, on the first day, a background of the Harmonist and Utopian Societies that influenced the original *Boatload of Knowledge.* Professor Richard Hartman, of the University of Pittsburgh, then described an overview of the ecology of the Ohio River. These two presentations provided the basis for studying human impacts on the river and the impact of the river on humans. Other speakers were invited to discuss a number of other topics throughout the trip. Among topics addressed were water quality, navigation, historical and cultural influences, river museums and historical/archaeological sites, geology, toxic pollution, riparian vegetation, fish and other aquatic organisms, erosion, acid deposition, and recreation. Although these items were discussed at particular points as the specific topic of the hour, each topic recurred throughout the trip. Thus, like the river, the continuity of topics were ever present.

The settings for the presentations were diverse (Fig. 4). Lectures were often held in the back of the boat as it cruised downstream, but some lectures were in more formal settings in lecture rooms or halls on campuses. Many demonstrations took advantage of the location. Fish sampling and mussel brailling demonstrations were given on the river itself, with student participation. River erosion discussion was continuous, as the boat passed many sites where erosion had been studied by the lecturer. Formal tours were given of a number of sites including Old Economy Village, Blennerhasset Island, a chemical plant, two power plants, a navigation lock and dam (Hannibal), and a municipal sewage treatment plant.

TABLE 1.

Topics covered in lectures, tours and demonstrations for participants in the Boatload of Knowledge *on the Ohio River*

Ecological

- water quality of the Ohio River and its tributaries
- water quality continuous sampling
- ecotoxicity testing
- acid mine drainage in the Ohio River Basin
- fishes of the Ohio; demonstrations of gill netting and electroshocking
- dredging (brailling) for mussels
- sediment coring and mutagenicity testing
- the river bank erosion problem
- forest ecosystems of the Ohio River valley
- groundwater pollution
- human health and environmental toxicology
- limnology and plankton of the Ohio
- case studies of major tributaries-Kanawha and Kentucky Rivers
- geologic formations-tour of Devonian "Falls of the Ohio"

Historical/Cultural

- history of the original *Boatload of Knowledge*
- industry of the Ohio River Valley
- tour of chemical plants
- tour of historic Blennerhasset Island
- tour of 19th century Old Economy Village
- tour of electric power plant
- tour of air pollution control sulfur scrubbers
- archaeological excavation site
- history of human settlements along the Ohio
- tour of sewage treatment facility
- museum tours related to Ohio River history
- tour of lock and dam on the Ohio/ old lock and dam museum

The quality of the *Boatload of Knowledge* faculty (Table 2) and students was the reason for the apparent success of the educational aspect of the trip. Formal lectures were given by 18 faculty members from 11 universities and colleges (Table 2). Another 30 individuals from various state and federal agencies and industries participated in lectures, demonstrations, or tours for the students. Many others participated in less formal, but nevertheless important, ways. Several other faculty and/or students from West Virginia University, University of Kentucky, Marshall University, and University of Cincinnati joined the trip for portions of the journey in response to our general invitation in the ORBCRE newsletter to "hop aboard." Overall, 173 names appeared on the boat log as having taken part in some aspect of the trip.

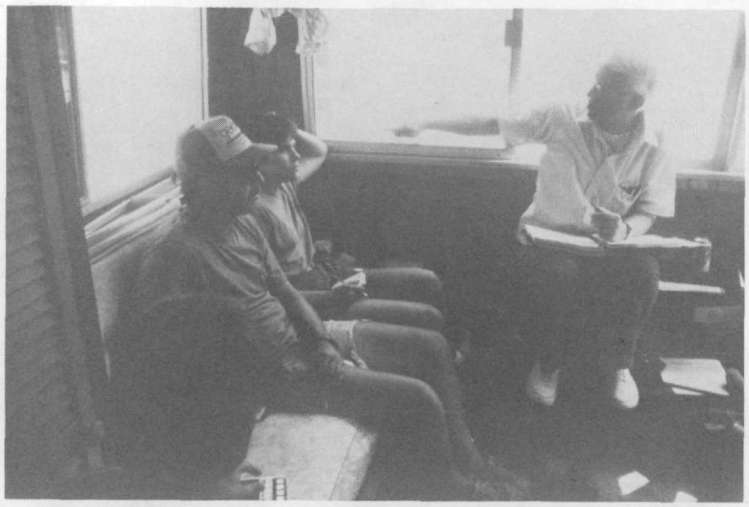
Research

One of the primary goals of the *Boatload of Knowledge* was to encourage student-initiated research on environmental issues related to the Ohio River. Six graduate students representing five universities in the Ohio River Basin Consortium were involved in research along the *Boatload* journey (Fig. 5). The projects ranged from water and sediment sampling of the Ohio River to a bird census along the length of the Ohio River. A summary of preliminary results of each research project, presented in a final report (Mitsch and Mullins 1988), is given here.

POLYCYCLIC AROMATIC HYDROCARBONS IN OHIO RIVER SEDIMENTS (James Fath, Miami University)—Polycyclic aromatic hydrocarbons (PAH) are a large class of organic carbons indicative of oil spills, industrial activity, fossil fuel combustion, and other human activity. Sediment samples were taken with an Ekman dredge near industrial sources and behind navigation dams along the Ohio River from Chester, WV, to Louisville, KY. Samples were then extracted and analyzed with high performance liquid chromatography (HPLC). Preliminary data indicate some PAH contamination behind four of the navigation dams.

METALS IN OHIO RIVER SEDIMENTS (John Youger, The Ohio State University)—Sediment samples were collected with an Ekman dredge from the boat at 11 sites along the river between Pittsburgh and Louisville, primarily from sites upstream of navigation dams. Sediment samples were subsequently analyzed in the laboratory by atomic adsorption for barium, cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc. Metal concentrations were found to decrease from upstream to downstream sites, especially for cadmium, chromium, and zinc and were found to be somewhat lower than concentrations measured by the Ohio River Valley Water Sanitation Commission (ORSANCO) in 1977 at several sites (Youger and Mitsch 1989).

TRIBUTARY ELEMENTAL CONTRIBUTIONS TO OHIO RIVER (Jan Handke, University of Cincinnati)—Water samples were collected upstream and downstream of the confluence of several tributaries on the Ohio River. A Sargeant sampler was used for grab sample collection, and samples were filtered with a 0.45μm membrane fil-



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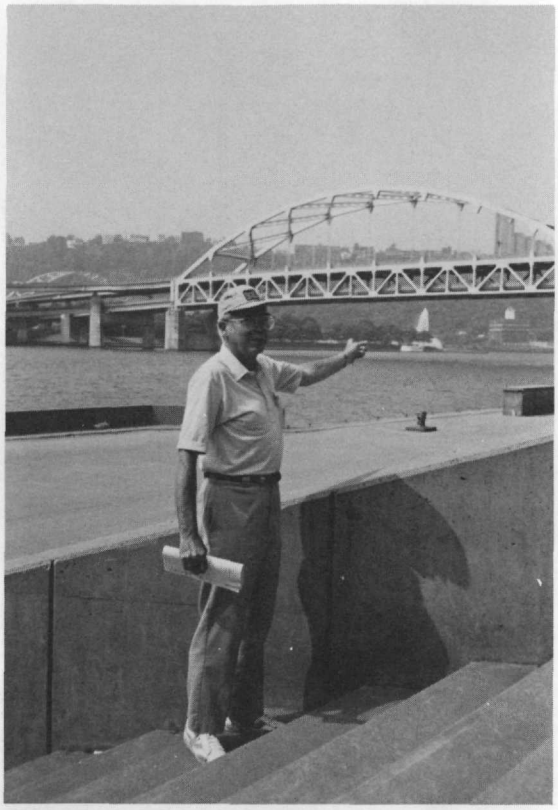

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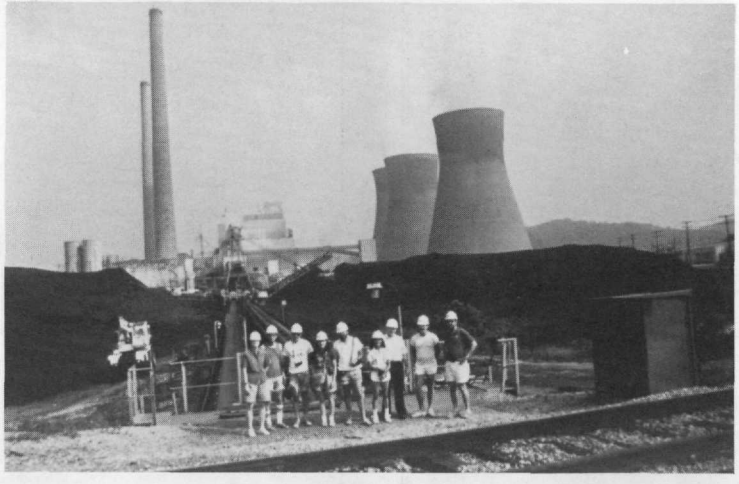

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FIGURE 4. Lectures and presentations took place on the *Boatload of Knowledge* in many locations including a) in the cabin of the boat; b) on the shore; c) at field demonstrations; and d) as tours of facilities.

ter to separate suspended solids. Comprehensive elemental analysis is being done by simultaneous inductively coupled plasma-atomic emission spectrometry. Data will be analyzed by comparing the upstream and downstream samples at each tributary for 34 elements to determine the additional elemental burden to the Ohio River contributed by each tributary. The results of this assessment, incomplete up to now, will be compared with historical data from the ORSANCO monitoring program to determine if additional monitoring is suggested for particular elements.

DISSOLVED OXYGEN PROFILES (Joseph P. Wellner, Jr., University of Kentucky)—Dissolved oxygen concentrations were measured downstream of three navigation dams and in the vicinity of six municipal discharges along the Ohio River. No discernable oxygen sags were noted downstream of the municipal discharges, and a slight increase was noted downstream of Cincinnati's municipal discharge. Measurements of dissolved oxygen upstream and downstream of the navigation dam did not support the hypothesis that the dams served as aerating systems for the Ohio River (Wellner and Dinger 1989).

TABLE 2.
Faculty and their expertise for the Boatload of Knowledge *course on the Ohio River*

Institution	Faculty Member	Affiliation	Expertise
Academic Institutions			
Butler University Indianapolis, IN	Orie Loucks	Holcomb Research Institute	Forest Ecology and Acid Precipitation
University of Cincinnati Cincinnati, OH	Michael C. Miller Wilson Tabor	Department of Biological Sciences Institute of Environmental Health	Ohio River Limnology Health Effects of Ohio River
Eastern Kentucky University Richmond, KY	William H. Martin	Division of Natural Areas	Ecology of Kentucky River Basin
Jefferson Technical Institute Steubenville, OH	Louis Xidis		Industry of the Upper Ohio River Valley
University of Louisville Louisville, KY	D. J. Hagerty Jan Stevenson William Pearson	Civil Engineering Department Department of Biology Water Resources Laboratory	River Erosion Ohio River Plankton Falls of the Ohio
Marshall University Huntington, WV	Ralph Taylor Marcus C. Waldron Alan White	Department of Biological Sciences Department of Biological Sciences Department of Biological Sciences	Mussel Ecology Kanawha River Ecology Mutagenicity Testing and Sediment Sampling
Ohio University Athens, OH	Hugh Bloemer	Department of Geography	Cultural Settlement Patterns in Ohio Valley
The Ohio State University Columbus, OH	Scott Bair William J. Mitsch Gary Mullins	Department of Geology School of Natural Resources School of Natural Resources	Groundwater Resources Water Quality Environmental Education
University of Pittsburgh Pittsburgh, PA	Richard Hartman	Department of Biological Sciences	Water Quality of Upper Ohio River
University of Southern Indiana Evansville, IN	Donald E. Pitzer	Center for Communal Studies	Original 1825-26 Boatload of Knowledge
West Virginia University Morgantown, WV	John J. Renton	Department of Geology/Geography	Acid Mine Drainage
Agencies and Industries			
Appalachian Power Company (AEP) St. Albans, WV Roanoke, VA	Leroy Balding Richard K. Burton	John Amos Power Plant APC Headquarters	Power Plant Tour Electric Power Generation
Blennerhasset Historical Park Commission Parkersburg, WV	Ray Swick	Director	Early American History of Ohio River; Blennerhasset Island

Cincinnati Gas & Electric Company			
Union, KY	William S. Deus	East Bend Power Plant	Air Pollution Scrubbers
Cincinnati, OH	Bob McElfresh		Air Pollution Scrubbers
Union, KY	James M. Guilfoyh	East Bend Power Plant	Air Pollution Scrubbers
E. I. du Pont de Nemours Co.	Art Huston		Chemical Industry
Washington, WV	Walt Stewart		Chemical Industry
Huntington Museum of Art	Beth Hager	Exhibit Curator	"Ohio River Odyssey" Exhibit
Huntington, WV	Marilyn Doudin		"Ohio River Odyssey" Exhibit
Mill Creek Treatment Plant	Bob Davison	Plant Manager	Municipal Wastewater Treatment
Cincinnati, OH			
Monsanto Corporation	Keith Miller		Kanawha River Chemical
Nitro, WV			Industries
Old Economy Village	Raymond Sheperd	Director	Old Economy Settlement
Ambridge, PA			
ORSANCO	Peter Tennant		History of Water Quality Management
Cincinnati, OH			of Ohio River
U.S. Army Corps of Engineers			
Hannibal, OH	David L. Walters	Hannibal Lock and Dam	Lock and Dam Operation
Huntington, WV	Bob Maskowski	Huntington District	Archaeological Research along Ohio
Huntington, WV	Gregory L. Abbott	Huntington District	Ohio River Navigation
Huntington, WV	Michael F. Spoor	Huntington District	Ohio River Erosion
Louisville, KY	Terry Siemsen	Louisville District	Ohio River Sediments
U.S. Environmental Protection Agency			
Wheeling, WV	Gary Bryant	Wheeling Laboratory–Region III	Water Quality Monitoring
Wheeling, WV	Robert L. Donaghy	Wheeling Laboratory–Region III	Toxicology Testing
Cincinnati, OH	Andrea Tanner	Breidenbach Environ. Research Ctr.	EPA Tours
Cincinnati, OH	Randy Bruins	Breidenbach Environ. Research Ctr.	Risk Assessment
U.S. Fish & Wildlife Service			
Elkins, WV	William A. Tolin		Ohio River Aquatic Life
	John E. Schmidt		Ohio River Aquatic Life
West Virginia Department of Natural Resources			
Belleville, WV	Del Lobb		Ohio River Fishes
Parkersburg, WV	Scott Morrison		Ohio River Fishes
MacArthur, WV	Mike Zeto		Ohio River Mussels
Parkersburg, WV	Ron Wigal		Ohio River Mussels
St. Albans, WV	Eric A. Paul		Ohio River Mussels
Others			
Maysville, KY	Harriett Cartmell	Mayor	Tour of Historic Maysville, KY
Louisville, KY	Grady Clay	Urban Designer	Urban Development
Louisville, KY	Judith McCandless	Environmentalist	Environmental Policy

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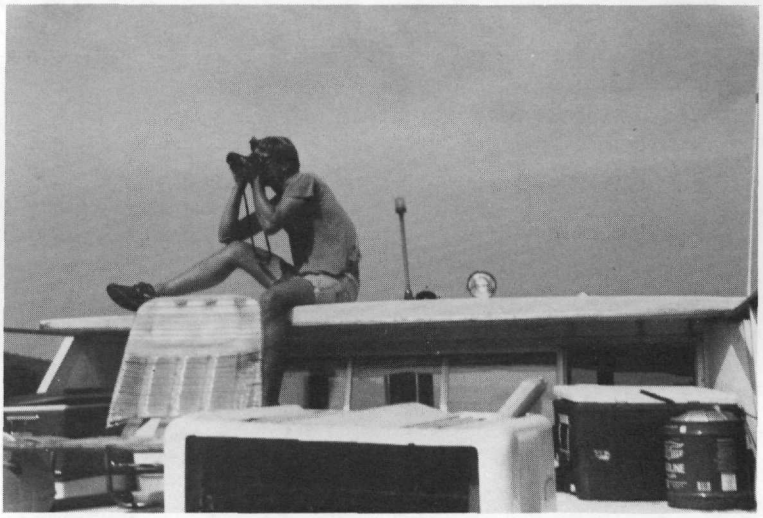

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FIGURE 5. Research on the *Boatload of Knowledge* involved a) sediment sampling; b) water sampling and analysis; c) examination of terrestrial vegetation for air pollution damage; and d) bird census.

VEGETATION DAMAGE FROM AIR POLLUTION (Sangita Patel, The Ohio State University) — Terrestrial vegetation was sampled and examined for evidence of foliar damage whenever it was possible to disembark from the boat. Photographic records of damage, identification of pollution injury, and mapping of possible

sources and damage were also recorded. The data gave preliminary indication of sulfur dioxide injury near power plants and fluoride injury near chemical plants.

BIRDS OF THE OHIO RIVER (David Todt, Shawnee State University)—Birds were censused along the Ohio River from Pittsburgh to Louisville to investigate changes in species and diversity along the river corridor and to investigate the possibility of using such information as an indicator of environmental quality. Most of the students on the *Boatload* also participated in this count. Counts and diversity were found to be different along the river corridor and were compared with historical records (Todt 1989).

Time and College Credit

Each student spent a total of 80 hours at formal presentations in the course and 20 to 40 hours on research during the boat trip. The rest of the time was spent on land transportation to and from demonstrations (10 hours), informal discussions and free time (55 hours), and lunches (15 hours). This amount of formal educational and research time meant that days started early (usually on the boat by 8:00 A.M.) and ended late (usually between 8:00 and 10:00 P.M.). The total academic time of approximately 100 to 120 hours is equivalent to about 5 to 6 quarter hours or 4 to 5 semester hours of credit. Sample analysis, data reduction, and report-writing by the graduate students after the trip were equivalent to several more hours of credit. Students were required to take credit hours under their faculty advisor at their home institution, with credit hours generally ranging from 4 to 6 quarter hours equivalent. It appears that slightly more hours, perhaps 7 to 8 quarter hours, would have been the appropriate academic credit for active participation in the *Boatload of Knowledge.*

Perspectives of the Ohio River

The Ohio River as a classroom of water provided an unusual opportunity to see the Ohio River Valley from both ecological and historical perspectives. At times, the ecology dominated; at other times, the culture and history dominated. When they overlapped, as with the example of abandoned button factories which utilized river mussels, the importance of a resource such as the Ohio River was well-illustrated.

ECOLOGICAL PERSPECTIVE. The Ohio River must be regarded as a system in order to understand it properly and to consider the myriad of environmental issues that impact the river on a continual basis. The course provided background on almost every aspect of the river. There were demonstrations of water quality sampling, laboratory methodologies, toxicity studies, sediment sampling, human health implications of drinking water, and even a lecture on risk assessment. The students learned about the fish and benthic fauna of the river from experts who investigate those subjects almost daily. There were also lectures and discussion of issues such as acid mine drainage, river bank erosion, and groundwater pollution. Effects of acidic deposition and other human activities on terrestrial systems were discussed, and the sources of some air pollution problems—power plants—were visited to see how they work and how they are facing these environmental issues. Case studies of the Kanawha River and the Kentucky River Basin added reality to the systems view that the Ohio River is a function of its watershed. Finally, a tour of the Devonian "Falls of the Ohio" at Louisville put the river into a completely different perspective—its geological history.

HISTORICAL AND CULTURAL PERSPECTIVES. The human history of the Ohio River was evident, and at times overpowering, along the trip (Fig. 6). The group stopped at Old Economy Village, a southwestern Pennsylvania town, now restored, where the original *Boatload of Knowledge* stopped 162 years before. The stop at Blennerhasset Island near Parkersburg, WV, gave a vivid picture of the river and its life during the exciting days of Westward expansion following the American Revolution, and of the setting where Aaron Burr purportedly conspired against his new nation. The boat landed in Point Pleasant, WV, the site of Chief Cornstalk's reign and an early battle of the American Revolution involving English-supported American Indians. Students also viewed archaeological excavations of sites by the U.S. Army Corps of Engineers near the Gallipolis Locks and Dam, where artifacts and settlements from 200 BC to 1100 AD have been uncovered. There were constant reminders of the Twentieth-Century history of the Ohio River, particularly of the rise and fall of steel and other industries and the pollution they left behind. Visits to the chemical industries along the Ohio and Kanawha Rivers showed another industry that has had great economic and environmental significance to the people along the Ohio River. The students were impressed as they heard about one industry after another in the river valley that depended on, and sometimes depleted, resources such as forests, oil, mussels (for buttons), limestone, and the ever-present coal, which now fuels over 35,000 megawatts of electricity along the river. The students also sensed a renaissance in many river cities and towns as the water became cleaner, the fish returned, and buildings once again faced toward the river rather than away from the once highly polluted corridor. The river is now less of a sewer and more of a highway. Ohio River festivals are again plentiful along this "Rhine of North America."

Surprises and Other Delights

There were countless surprises, mostly pleasant, as the boat journeyed down the Ohio River. On numerous occasions, people assembled at the boat dock to greet the boat, having heard through articles in the paper or through word of mouth about the *Boatload of Knowledge.* The welcomes were particularly warm in the small towns of Ravenswood, WV, Portsmouth, OH, and Maysville, KY. In Ravenswood, many townspeople escorted the boat to dock with motor boats and provided free dinner and breakfast at a local restaurant. In Portsmouth, the local people provided housing for the group of faculty and students in their private homes and were genuinely interested in our experiences. Several of the citizens of Maysville, including the mayor, turned out to greet the arrival of the boat and led us on tours of some of the historic sites of the city. Wherever the boat docked,

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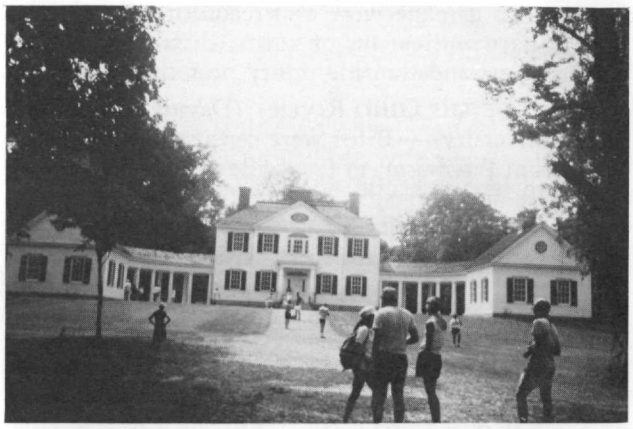

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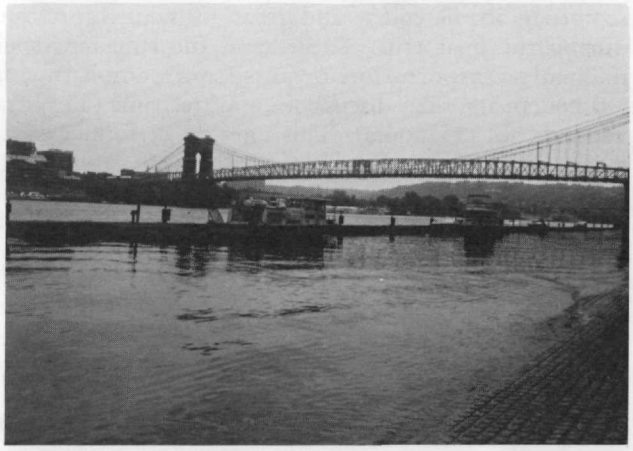

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FIGURE 6. There are many historical sites along the Ohio River, including a) Old Economy Village, PA; b) Blennerhasset Mansion and Island, WV; c) restored riverfront village of Augusta, KY; d) suspension bridge in Cincinnati, OH.

there were always individuals who were helpful well beyond the expected. The trip seemed to catch their imagination (many expressed the wish that they could take such a journey) and made them feel proud of their Ohio River heritage.

The Louisville Metropolitan Sewer District and the Louisville Gas and Electric Company sponsored a final celebration banquet for the *Boatload of Knowledge* participants in Louisville on the evening of our arrival there. Approximately 40 people attended the banquet, including the students and organizers, representatives of industries and universities, some of the *Boatload* faculty, and interested supporters. Speeches were made and certificates distributed to the students in testimony of their completion of the historic voyage.

Press and Public Relations

Another pleasant surprise of the adventure was the press coverage that resulted from the trip. At least 11 newspaper articles were written about the *Boatload,* and 50 or more radio inquiries were made to The Ohio State University about the trip. Film crews from The Ohio State University, Steubenville, OH, Wheeling, WV, Huntington, WV, and Cincinnati, OH, spent time aboard and developed spots for news programs. John Fleischman of *Ohio Magazine* spent six days with the voyage to develop an article on the Ohio River in that magazine. The March 1988 issue of ***Ohio 21***, a magazine published by The Ohio State University College of Agriculture for alumni and friends, featured an article about the *Boatload of Knowledge* (Kauffeld 1988). The article, titled ***Take Me to the River***, included five pages of text and nine photographs taken by participants in the *Boatload of Knowledge.* A one-minute spot on the *Boatload of Knowledge* was developed and aired on public television stations in Ohio during half-time for The Ohio State University vs. West Virginia University game in September 1987.

CONCLUSIONS

There has been much interest in directing the *Boatload of Knowledge* again, perhaps on an annual basis. Ideas for the *Boatload of Knowledge* could include not only offering the course for college students, but also high school students, lawyers, businessmen, legislators, and government officials in the region. In order to have the *Boatload* on an annual basis, a secure source of funding would be required. Also, a boat more suitable for large groups and equipped with research facilities would be necessary. Nevertheless, efforts have been made and will continue to be made through the ORBCRE and its member universities to continue the *Boatload of Knowledge.*

The evolution and development of the *Boatload of Knowledge* project afforded the organizers an excellent

opportunity to experience firsthand the interaction of logistics, education, and research. A river trip of this length and logistical complexity provided a challenge. Combining an ongoing graduate-level academic course with a major research effort required extensive organization and attention to deail. The *Boatload of Knowledge* proved to be an excellent educational and research opportunity for all participants. Logistics, curriculum, and recruitment exceeded the expectations of the organizers. The research accomplished on this trip has served two purposes: 1) some of it (Todt 1989; Youger and Mitsch 1989; Wellner and Dinger 1989) has been published in the open literature for the benefit of future research on these topics; and 2) all of it encouraged the young researchers to a better understanding of the approaches, benefits, and pitfalls of field research. By maintaining an optimal number of quality students, an extensive and knowledgeable faculty, and numerous hosts and tour leaders spaced equally over 15 days, and by having well-planned ground and water transportation and support services, the trip was most successful. Although planned primarily for the graduate students, all individuals who participated obtained a new perspective on the importance of the river. Awareness is a key to successful education. All indications are that the *Boatload of Knowledge* heightened awareness of countless people of the Ohio River—from university football spectators who saw a half-time highlight of the trip on television to a Kentucky riverbank fisherman who commented that he had never thought about the river as a teacher.

ACKNOWLEDGMENTS. The *Boatload of Knowledge* was successful because of the support of a great many people. Special recognition for help in early development of the project must be given to Mr. Sherman "Jack" Frost of The Ohio State University, who suggested the idea of a "river school" and to Dr. Charles King of The Ohio Biological Survey, who suggested adding the historical context of the original *Boatload of Knowledge*. Siobhan Fennessy served tirelessly as a graduate associate on the project, taking care of details that were necessary to make the trip so successful. Judy Kauffeld, editor for the School of Natural Resources, was particularly helpful in desk-top publishing and publicizing the voyage. The trip was made possible by a grant from the Virginia Environmental Endowment (Gerald P. McCarthy, Director). Additional support was contributed by The Ohio State University's School of Natural Resources, OARDC, and the Ohio River Basin Consortium for Research and Education. Useful comments were provided by two anonymous reviewers, the editor of the journal, and Ruthmarie H. Mitsch. OARDC Manuscript Number 98-89.

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